

New Wireless Sensors for Diagnostics Under Harsh Environments, Phase I

Completed Technology Project (2011 - 2011)



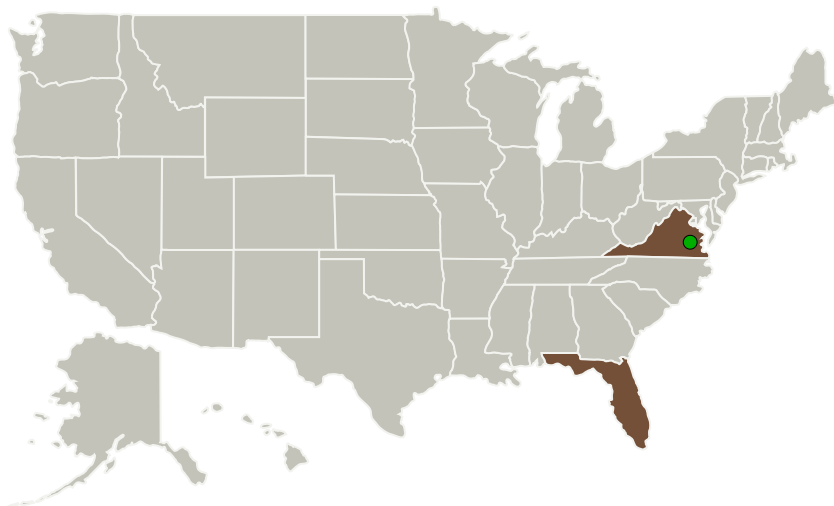
Project Introduction

There is an acute need for robust sensors and sensor systems capable of operation in harsh environments. In particular, high temperature passive wireless surface acoustic wave (SAW) sensors are highly desirable for improving safety and efficiency in aviation and space vehicles. Such sensors are used for the detection of fuel leaks in engines, fire in its initial stages, fuel flow modulation and control and monitoring, and in-flight NDE and diagnostics of vehicles. In this project, we will 1) develop a relatively new crystal material suitable for high-temperature SAWs; 2) design SAW sensors and investigate extremely high temperature operation (up to 1000

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C) of the SAW sensor embodiments; 3) Integrate the SAW and antenna onto the wafer such that there are no external connections. This will form a fully integrated sensor antenna device without any external bonds or soldering. Phase I will include substantial materials development and characterization for uniformity and repeatability in SAWs. Prototype SAW designs will be developed and high-temperature characteristics evaluated. Phase II will develop a fully integrated sensor antenna and upscale the crystal growth for 3-4in SAW wafers. Probability for Phase III commercialization of both the wireless SAW sensors and SAW wafers is high.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Krystal Engineering LLC	Lead Organization	Industry	Titusville, Florida
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Florida	Virginia

Project Transitions

 **February 2011:** Project Start

 **September 2011:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140167>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Krystal Engineering LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Christine K Rivenbark

Co-Investigator:

Christine Rivenbark

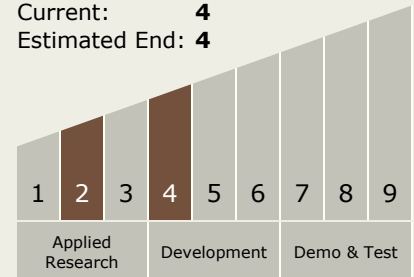
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Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.3 Mechanical Systems
 - └ TX12.3.4 Reliability, Life Assessment, and Health Monitoring

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System